

L7(6.3) - Vertex Form by Completing the Square

Recall:

Vertex form: $y = a(x - h)^2 + k$

Note that $(x - h)^2$ is a perfect square.In general, for perfect square trinomials,

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

Identify the missing constant so that the trinomial is a perfect square trinomial, then factor it.

$$x^2 + 6x + \underline{9} = (x+3)^2$$

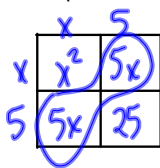
$$x^2 - 4x + \underline{4} = (x-2)^2$$

Ex.1 What is missing from these perfect squares?

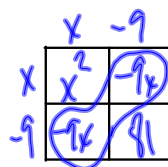
(a) $x^2 + 10x + \underline{25} = (x+5)^2$

$$y = (x+5)(x+5)$$

$x = -5$ $x = -5$



(b) $x^2 - 18x + \underline{81} = (x-9)^2$



Identify the missing constant so that the trinomial is a perfect square trinomial. You will have some tiles "left over".

$$x^2 + 6x + \underline{3} = (x+3)^2 - 6$$

$$y = (x+3)^2 - 6$$

Identify the missing constant so that the trinomial is a perfect square trinomial. You will have some tiles "left over".

$x^2 - 4x - 3 = (x - 2)^2 \underline{-4-3}$

$y = (x-2)^2 - 7$

Steps:

- 1) Factor out 'a' from the first two terms.
- 2) Force a perfect square for the factored first two terms.
- 3) Collect the constants.

Ex.2 Complete the square for each of the following

a) $y = x^2 + 12x - 7$

$$= x^2 + 12x + 36 - 36 - 7$$

$$= (x+6)^2 - 43$$

$$\textcircled{1} 12 \div 2 = 6$$

$$\textcircled{2} (6)^2 = 36$$

b) $y = x^2 - 20x + 15$

$$= x^2 - 20x + 100 - 100 + 15$$

$$= (x-10)^2 - 85$$

c) $y = 3x^2 + 12x + 11$

extra step 1a

Coefficient out of the 1st two

$$= 3(x^2 + 4x) + 11$$

$$= 3(x^2 + 4x + 4 - 4) + 11$$

$$= 3[(x+2) - 4] + 11$$

$$= 3(x+2)^2 - 12 + 11$$

$$= 3(x+2)^2 - 1$$

d) $y = -x^2 + 6x + 13$

$$= -1(x^2 - 6x) + 13$$

$$= -1(x^2 - 6x + 9 - 9) + 13$$

$$= -1[(x-3)^2 - 9] + 13$$

$$= -(x-3)^2 + 9 + 13$$

$$= -(x-3)^2 + 22$$

Assigned Work:

p. 331 # 2ab, 3ab, 5ac,
7ab, 9, 11, 16